

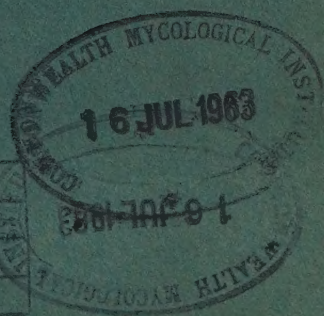


The
Commonwealth
Forestry Institute
University of Oxford

THIRTY-EIGHTH ANNUAL REPORT

1961-62

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UNIVERSITY OF OXFORD

THIRTY-EIGHTH ANNUAL REPORT OF THE COMMONWEALTH FORESTRY INSTITUTE

ACADEMIC YEAR, 1961-62

Introduction. On the 7th of November 1961 in accordance with current practice the name of the 'Imperial Forestry Institute' was changed to the 'Commonwealth Forestry Institute'.

Mr. W. R. Day retired on 30 September 1961. He joined the staff in 1924 and was head of the Pathological Section of the Institute throughout this period. He kindly continued teaching through Michaelmas and Hilary Terms until his successor, Dr. T. W. Tinsley, was able to take up his duties.

Dr. Tinsley is a graduate of both Durham and London Universities and held various posts before joining the Institute, including those of Plant Pathologist at Rothamsted Experimental Station, and in the West African Cocoa Research Institute at Tafo, Ghana. He was Deputy Director of the West African Cocoa Research Institute, Ibadan, from 1957 and Honorary Lecturer in Plant Pathology, University College of Ibadan, Nigeria, from 1959 until his appointment here. We all wish him a long and successful career in the Department.

Building. The new top floor has now been completed and is providing much needed additional accommodation.

Students. The total number of students was 57, as well as 3 advanced students who have been granted leave of absence. The 57 include 2 who were here only one term, and 5 who spent only two terms here.

Eleven students were successful in the Examinations for the Forestry Honours Degree. The classes obtained were three Seconds, four Thirds, and four Fourths. Of these eleven students, two have returned to their own countries to take up appointments, one, a Probationer candidate for H.M.O.C.S., has returned to his Colony, three have obtained appointments in H.M.O.C.S., through the Department of Technical Co-operation, one obtained a Beaverbrook Fellowship and has gone to the University of New Brunswick for a year, one (a New Zealander) is going to Aberystwyth to study Genetics at the Welsh Plant Breeding Station for two years before returning to take up a forestry research post in New Zealand, one has a post in the Intelligence Section of the Forest Products Research Laboratory, Princes Risborough, one has an appointment in private forestry, and the eleventh man has set himself up in business as a timber merchant.

There were seven students in the Third Year.

The full Forest Officers' Course was attended by 20 Officers, (17 from the Commonwealth and 3 from other countries). They came

from British Guiana (1), Burma (1), Ceylon (1), Cyprus (1), Federation of Nigeria (1), Ghana (1), India (5), Israel (1), Kenya (2), North Borneo (1), Northern Nigeria (1), Northern Rhodesia (1), Sudan (1), Trinidad (1), West Pakistan (1). In addition part of the course was attended by forest officers from Burma, Malaya, Peru, and Sudan (each for two terms), and from Turkey, Ghana Northern Rhodesia for shorter periods.

With the aid of a N.A.T.O. Scholarship a German student spent a year working here.

Research Students. Five students successfully submitted theses for the Diploma in Forestry. The theses were entitled:— (1) 'European Selection Forests with special reference to methods of yield determination in comparison with *Callitris glauca* forests of Southern Queensland'. (2) 'A study of the relationship between Government and Private Enterprise in Forestry with particular reference to British Columbia's Farm Licence Tenure'. (3) 'A study of the maximum rate of growth of some tree species in Britain in relation to thinning régimes'. (4) 'A study of factors influencing basal area increment of individual crop trees of Norway spruce'. (5) 'The influence of big game on forest management in the Mount Kenya and N.W. Aberdare forest reserves'.

Four students are working for the degree of D.Phil., and one for the degree of B.Sc.

Prizes. The Schlich Memorial Prize was awarded to K. F. S. King, Assistant Conservator of Forests, British Guiana. Messrs. C. W. Davis (Northern Rhodesia), A. J. Hepburn (North Borneo), and M. C. Nawaz (Pakistan) were specially mentioned as 'runners-up'.

The School of Forestry Jubilee Prize was awarded to R. D. Burdon, a New Zealand Scholar.

Scholarships. The S. E. Wilson Scholarship was awarded to J. G. K. Flower-Ellis.

Instructional Tours. (1) The Introductory Tour in Britain for students starting the course for the Final Honour School and others unfamiliar with British forestry was made as usual just before Michaelmas Term. The tour was conducted by Mr. Edwardson accompanied by Mr. Pitt. Utilisation visits were made to Longhope Turney, Pine End Plywood Factory, Sudbrook Pulp-mill and Monmouth Saw Mills. The Sudbrook visit made it necessary to adjust the usual Dean and Tintern routes: in the Dean, Highmeadow was visited again after many years, and Abbotswood, Blakeney Hill, Parkhill and Viney Hill Nursery were also included. The Tintern visit was confined to Cleddon, Whitestone, Pont-y-saison and Crumblands. The Welsh State forest visited was Mynydd Ddu, and in Herefordshire woodland properties managed by Economic Forestry Limited (Cannon Pyon, Nupton), Tilhill Forestry (Hereford) Ltd., and Severn End Wood-

lands, (the property of Mr. B. H. Lechmere) were visited. Major Pilling, forestry consultant, helped with the demonstration at Severn End.

The party comprised seven Honour Moderations undergraduates, overseas post-graduates from India, Pakistan, Burma, Australia, Sudan, Turkey and Peru, and a special course student from Nigeria.

(2) *Western France.* The annual tour to Normandy and the Landes was conducted by Mr. Edwardson accompanied by Mr. Pitt. The party consisted of eight third year students together with forest officers from India (5), Pakistan (1), Burma (1), and Israel (1). The State forests of Lyons, Bord, Louviers, Écouves, Reno, Bèlleme and Mimizan were visited, and in the Landes a private re-forestation scheme near Labouheyre and the Forêt Usagère de Biscarosse were seen. Utilization visits were to the hardwood pulpmill at Alizay, impregnation works at Alençon, the pulpmill and sawmill at Mimizan, and, for the first time, the resin distillation works at Biscarosse.

(3) *Eastern France and Switzerland.* Twelve Fourth Year Students together with a forester from Eastern Nigeria visited the forests in the French Jura and Switzerland during the Easter Vacation. The tour was led by Dr. E. W. Jones accompanied by Professor Laurie.

(4) *Postgraduate Tour in Great Britain.* Topics of current interest, not only in forestry but in other aspects of land use were included in this tour, conducted by Messrs. Edwardson and Gordon. The region was East Anglia, and the party comprised forest officers from East and West Africa, Borneo, Israel, British Guiana, Burma, India and Pakistan.

En route from Oxford to East Anglia, the Bedford Estates' extensive woodlands at Woburn were seen and, nearby, Bryant and May's new poplar plantation at Willington. A full range of subjects was demonstrated by the Forestry Commission at King's, Thetford and Salcey Forests, and by private estates at Horstead, Norwich (S. E. Gurney Esq.), Ryston Hall (Col. E. R. Pratt) and West Wycombe (F. Dashwood Esq.). Of more unusual land use interest were the woodlands at Corby (Messrs. Stewarts and Lloyds Minerals Ltd.) planted on worked ironstone land.

Not connected directly with forestry were the visits to Nature Conservancy work on Hickling Broad, and land drainage work in the King's Lynn and Downham Market areas by the Great Ouse River Board.

(5) *Postgraduate tour in Italy.* Under the leadership of Mr. W. A. Gordon and Dr. E. W. Jones a party of Forest Officers from Northern Rhodesia, North Borneo, Kenya, Trinidad, Nigeria, Burma, Pakistan, Ghana, Israel, Cyprus and India visited Italy

immediately after the end of Trinity Term. They saw conifer planting and poplar growing in the Po Valley, Eucalyptus research at Rome, erosion repair, afforestation, marsh reclamation and sand dune fixation in Sicily and Sardinia. Our thanks are due to the many Officers of the Italian Forest Service who helped to make the tour a success and particularly to Professor Camaiti, the Director General and to Dr. Bertini who accompanied the party for most of the journey.

Utilisation Courses. Nine Forest Officers attended a special four-day Wood Technology course at the Forest Products Research Laboratory, Princes Risborough, during the Easter Vacation; Third Year students spent two full days there during the Trinity Term. One Forest Officer spent some time there in connection with his special subject. Our grateful thanks are due to the Director and to those members of the staff who organized the visits and course, gave demonstrations and assisted the special subject.

Vacation Practical Work. During the summer of 1962 practical work was carried out by some students in Norway through the generous assistance of the Forest Service. The student, J. G. K. Flower-Ellis who gained the Wilson Scholarship, spent nearly three weeks working in a sawmill owned by F. Houghton Ltd., at Durley in Hampshire.

Excursions. During Trinity Term arrangements were made for the Forest Officers to visit the following research centres and estates:—Messrs. Wm. Mallinson's Timber Yards and Veneers, London, and Messrs. Montague Meyer (Celcure preservation plant); the Directorate of Overseas Surveys at Tolworth; the Forestry Commission Research Station, Alice Holt (two visits); the Timber Development Association Research Centre at Tylers Green; and the Cirencester Estate, property of Earl Bathurst. The Fourth Year Students joined the excursions to Cirencester and the Forestry Commission Research Station.

The Third and Fourth Year Students also visited Hampden Woods, owned by the Earl of Buckinghamshire.

The Third Year Students also visited the Forestry Commission forests at Bramshill and Savernake, and a private woodland owned by Mr. G. Palmer, of Priors Court, Hermitage, near Newbury.

Thanks are tendered to all who permitted students to visit their estates and factories.

Discussions and Seminars. During Michaelmas and Hilary terms, weekly discussions of forest topics of general interest, selected by the members of the Forest Officer's Course, were organised as usual. There were also two Seminar courses on the regeneration of tropical forests and on forest economics. During Trinity Term, short papers on selected topics (usually the Forest Officers' 'Advanced Study') were presented by the same group, each paper being followed by discussion.

Visiting Lecturers. The usual weekly series of invited lecturers in Hilary and Trinity Terms were given. These lectures, primarily for the postgraduate class and Fourth Year Students, deal mainly with topics not fully covered by the staff of the Department. The lectures were followed by discussions, and included the following subjects:—

Pulping of mixed hardwoods in Europe and in tropical countries.

Dr. T. H. Frankel, Wiggins Teape Group Supplies Ltd.

Road Building for forest traffic in the tropics, followed by a short film on road stabilisation. Mr. F. H. P. Williams, Tropical Section, Road Research Laboratory, Harmondsworth.

Timber imports from the commercial point of view. Mr. E. H. Richardson, Messrs. Wm. Mallinson and Sons Ltd.

Timber Farm Buildings. Mr. H. Redwood, Timber Development Association Research Laboratory, Tylers Green.

New Materials and Techniques—wood chipboard, followed by a film. Mr. L. E. Akers, Airscrew and Jicwood Ltd., Weybridge.

An outline of Forest Genetics and Tree Breeding, and The application of Forest Genetics and Tree Breeding in forest practice. Mr. J. D. Mathews, Forest Geneticist, Forestry Commission, Alice Holt Research Station.

Forest and Industry: the concept of full integration. Mr. K. N. Rankin, The Economic Forestry Group.

Photo interpretation with special reference to land use in the Fouta Djallon highlands in the West African Republic of Guinea. Dr. I. Langdale Brown, Forestry and Land Use Section, Directorate of Overseas Surveys, Tolworth.

Land Use Problems as affecting forestry. Dr. L. Dudley Stamp, C.B.E., London School of Economics.

Climatic Fluctuations in historical time. Professor G. Manley, Department of Geography, Bedford College, University of London.

The application of work study to pulpwood production. Mr. J. L. Zehetmayr, Work Study Section, Forestry Commission.

The measurement of growth rates in Commonwealth countries (particularly in underdeveloped Commonwealth countries) for purposes of forecasts of demand and planning of forestry development. Mr. Colin Clark, Director, Agricultural Economics Research Institute, Oxford.

The Colonial Development Corporation's forestry projects in Tanganyika and Swaziland. Mr. G. D. Gilbert, Forest Exploitation Officer, Colonial Development Corporation.

In the afternoon of his lecture Mr. Zehetmayr arranged a field

demonstration of how to carry out a simple work study (brashing) and his assistant, Mr. Patterson, gave some practical and useful hints on the use and maintenance of axes, bow saws, and chain saws.

Assistance from other Departments, etc. Special courses in surveying and soil science were given to Forestry students by Dr. A. R. Robbins of the Department of Surveying and Geodesy, and Dr. P. H. T. Beckett of the Department of Agriculture, Mr. J. Fraser Scott, Assistant to the Reader in Biometry, and Mr. G. B. Masfield, the University Lecturer in Overseas Agriculture, also gave courses to both undergraduates and postgraduates. The thanks of the Department are extended to all lecturers concerned and the Heads of their Departments.

Assistance to other Departments and Institutions. Mr. W. A. Gordon lectured on Colonial Forestry to the Overseas Administrative Cadets at both Oxford and Cambridge, the Overseas Agricultural Service Officers at the latter University, also attending. He also set and marked examination papers for the Administrative Cadets at both Oxford and Cambridge. Mr. Edwardson gave a full course of lectures in Forestry in the Cambridge academic year and Mr. Gordon gave three lectures on Forestry to students of the Department of Estate Management, and, in the Easter Vacation, Mr. Edwardson took them on a tour of State and private forests and utilisation centres in south-east England and the Home Counties.

Mr. Edwardson continued to be an examiner in the Third Public Examination of the Estate Management course at Cambridge, and was also an examiner for the National Diploma in Forestry.

Staff Tours. Professor Laurie represented the University of Oxford and the Society of Foresters at the Eighth British Commonwealth Forestry Conference, which was held in East Africa during July. Before joining the Conference he spent a short time in Malaya discussing various forestry problems there with the Chief Research Officer and his staff, and after the Conference he visited Kenya, Uganda, and Nigeria to look at their research organisations. He was away for approximately three months.

At the invitation of the Commonwealth Scientific and Industrial Research Organisation, Division of Soils, Adelaide, Dr. Leyton paid a ten-week visit to Australia, with the primary object of working out a research programme on the problems of pine growth, in collaboration with the Division of Soils and the Forest Departments of Western Australia, South Australia and the Australian Paper Manufacturers (Victoria). On his way back, he spent some time at the Indian Forest Research Institute at Dehra Dun, and also made a tour of forests in Israel.

During the summer of 1962, Mr. J. J. MacGregor, the Forest Economist, took a term of sabbatical leave in the U.S.A. and Canada in order to visit institutions where teaching or research was being conducted in the economics of forestry. University

Departments, the U.S.A. Forest Service at Washington, the International Bank of Reconstruction and Development, experimental stations, and private firms, foundations or associations provided the main sources of information. He lectured on problems of British forestry at some of the University centres and also attended a conference of the Lake State Forest Economists in Michigan and the White House Conference on Conservation.

Dr. E. W. Jones attended the meeting of the International Union of Forest Research Organisations in September, 1961, where he made many useful contacts.

Scientific Societies, Committees, etc. Members of the staff have been active on the Councils and Committees of various societies, as in previous years. Professor Laurie continued to be member of the Steering Committee of the Forest Products Research Laboratory, Princes Risborough, and of the D.S.I.R. Committee on Hydrological Research. He is also a member of the Council of the Empire Forestry Association and of the Society of Foresters. He serves on the Committee of the Bedgebury Pinetum and on the Advisory Committee of Westonbirt Arboretum.

Dr. Jones is a member of the working party of Section 23, International Union of Forest Research Organisations, which is preparing a multilingual glossary of silvicultural terms.

Mr. MacGregor attended a meeting in Geneva of the FAO/ECE Study Group on a Multilingual Glossary of Forest Work Science. He also continued to work with the Land Use Study Group of the Natural Resources (Technical) Committee at the Ministry for Science.

Editorial Committee. (Dr. Chalk, Dr. Jones, and Mr. Gordon). The Committee gave a short course of lectures to the graduate class on writing for publication and subsequently edited all work written for publication.

The following three articles, written by members of the 1960/61 graduate class, were accepted for publication:—

1. R. W. Greaves, 'A gravimetric determination of area.' (Empire Forestry Review.)
2. R. D. H. Rowe. 'Professional foresters: supply and demand.' (Empire Forestry Review.)
3. C. H. Murray. 'Teak and Fire in Trinidad.' (Caribbean Forester). One article from the 1961/62 class by A. E. K. Tisseverasinghe has been recommended for immediate publication and there are two others that could be made fit for publication by partial rewriting.

Senior Staff. As already mentioned, the major change on the Senior Staff this year has been the appointment of Dr. T. W. Tinsley, after the retirement of Mr. W. R. Day. We should like to take this opportunity of wishing Mr. Day a long and happy retirement.

Technical Staff. At the close of the year there were fifteen technical assistants working in the eight laboratories, the Photographer's and the Artist's sections being staffed by two Senior Technicians, and the Workshops by two Senior Technicians and one Technician.

Secretarial Staff. There has been no significant change in the secretarial staff during the year.

WYTHAM WOODS

Mr. F. C. Osmaston continued to superintend the management of the woods and Mr. H. Probitts remained as Forester.

The future policy of the management of the woods was under consideration of Council and was not decided by the end of the year under review.

Nevertheless the main provisions of the 1959 working plan were carried out and kept generally up to date. The main deviation from the plan was felling trees in Compartment 30 instead of Compartments 4 and 3 preparatory to plantation in 1962/3. This change was made to avoid disturbance to Biological research work as far as possible.

The main event in the year was receipt of sanction to buy mechanical equipment, the lack of which has greatly handicapped work, particularly maintenance and improvement of rides. A 4-wheel drive tractor, with winch and bulldozer blades, was bought as well as auxiliary equipment of a 'Super Swipe' for clearance of scrub growth and a tipping 2-wheel trailer. In consequence some 7 or 8 miles of ride were cut and cleared of growth to a width of 15 to 21 feet and 350 yards of very wet and rutted ride have been cambered to 21 feet wide and culverted with 3 piped culverts. Additionally some 1,500 yards of ride were cleared to a width of 25 feet cutting young poles and scrub which had narrowed the rides to some 10 or 12 feet in many places so that they were becoming mere tunnels enveloped by encroaching scrub.

Thinnings in hardwood compartments were kept up to date, but thinning part of Compartment 29 under plantation was postponed as it is estimated that yields from thinnings will be low next year. The progress of thinned stands is generally very encouraging. In hardwood compartments thinning included the removal of dying, unhealthy or over-mature trees and some sound mature trees where they interfered with promising poles or natural regeneration. No permanent gap will have been caused by these thinnings but in places they should increase the structural irregularity of the stands and thereby enhance the beauty of the woods.

The main fellings of 135 trees (of which 124 were above 12 inches quarter girth) were taken from the 1963 plantation area and the thinnings referred to above. Size and quality of the trees were above average and included a number of elm which fetched good

prices. Moreover the sites were more accessible than usual. So income from the main felling was comparatively high, £1,500 for an estimated timber volume of 9,899 hop. feet compared with £650 for 5,660 hop. feet last year.

The out-turn of poles from thinnings was also higher and the income in proportion as there was no rise in prices.

An area of 13.3 acres was planted in Compartment 14. The droughts and cold winds in May and June caused considerable casualties in Thuya and Tsuga nurses to the oak and may require substantial beating up next season. But the oak and beech are generally very healthy. Owing to grass competition in old agricultural land planted in 1959 without ploughing in Compartments 55 and 56, casualties are still occurring and only the Norway spruce looks really healthy. Experiments to test the relative efficacy of applying 'Dalapon' grass killer and hoeing are being started.

Dr. Jones has also been investigating the effect of European larch and Thuya as nurses to oak. Two subsidiary matters noticed have been the excellent and rapid healing of pruning scars on young oak and the reduction of diameter increment caused by pruning lower branches of Thuya for sale as decorative foilage.

Deer remain at 20 head or more and cause serious damage, but the squirrel population has declined noticeably from the high, damaging population of last year. Possible causes of the rapid decline are not only the long, cold winter but a skin disease. The Forester destroyed one squirrel that was naked of fur due perhaps to a form of mange. Rabbits have been increasing but it is hoped that the cutting of grass, bracken and other growth on rides with the machinery now available will make it much easier to see and shoot rabbits. Preliminary results confirm this hope.

Although the uncertainty of future policy in the woods has discouraged the start of long term research, the woods have continued to be used for silvicultural instruction, practice in road alignment and special subject projects as well as research work by the staff.

BAGLEY WOOD

Pending the publication of the Forestry Commission Dedication Plan of Operations in an amended form, the basic felling, planting and thinning proposals for the period 1962 to 1966 were submitted to the Forestry Commission. Work continues with the preparation of a second version of the current plan based on the Forestry Commission State Forest Working Plan Code.

Ten acres of new planting was carried out in the year, including $2\frac{1}{2}$ acres in the recent addition (Woodcraft wood), as well as an under-planting of Japanese Larch with a mixture of *Nothofagus* and *Abies alba* (ex Normandy), and the replacement of the moribund Sitka spruce 'quarter acres plot' by the hybrid Leyland cypress. In the West Wood, $\frac{3}{4}$ acre of planting was of oak areas

telled after serving to screen re-forestation of the past 10 years. Thirty acres were thinned. The heavy demand on the mill for stakes, oak and conifer lumber, firewood and sawn mining timber continued.

The Forestry Commission Mensuration Branch demonstrated current permanent sample plot techniques in Bagley Plot No. 2 (*Tsuga heterophylla*) and remeasured Bagley Plot No. 6 (Corsican pine).

The numbers of grey squirrels declined greatly in the winter, but enough remained to make possible a television interview with the Woodman in connection with 'Grey Squirrel Year'.

Visitors to the wood in the year included the College's Bagley Wood Committee, the Dean Forester Training School, the Cambridge University Estate Management Course, a squirrel trapping demonstration by the Timber Growers Organisation, Forestry Commission registered seed-source collectors, Dr. S. E. Wilson, forest officers and foresters of the Chilterns district, the Bucks and Oxon Rural Studies Association, Dr. Miraboglu (Turkey), Dr. Vuokila (Finland), Dr. Villasenor (Mexico) and Mr. Akyildiz (Turkey).

SILVICULTURE

Dr. E. W. Jones continued in charge of this section, with one assistant.

Teaching. Dr. Jones gave 24 lectures in silviculture to the Third Year students and 8 to the Fourth Year students. He also gave three lectures out of a course of ecology lectures given to the Third Year students by Dr. Dimbleby, Mr. Hoyle, and Dr. Jones. He gave 16 lectures in ecology to the Forest Officers and the Fourth Year students. He also gave 6 introductory lectures on their forthcoming continental tours to the Third and Fourth Year students. Dr. Jones took part also in the seminars on the regeneration of tropical forests.

Research Work on the material brought back from Northern Nigeria in 1958 is now complete and two papers are ready for publication. The subject under study was the ecology of the kurame (forest outliers) in the Guinea Savanna of Northern Nigeria. Full details of the work have been deposited with the Federal Department of Forest Research in Nigeria, and will of course also be available in Oxford.

Advantage was taken of the thinning carried out in the spring of 1962 in compartment 32 of Wytham Wood to study the results of the alternative 3-row belts of Oak with European Larch and *Thuya* which were planted in 1947. The oak planted between larch now range from about 23 to 35 feet tall (dominants), and average about five feet taller than those between *Thuya*.

Ismail bin Johari studied the Forestry Commission sample plots

of Corsican pine in East Anglia and of Norway spruce at Bowmont in order to compare their actual rates of diameter growth under heavy thinning regimes with those predicted from the schedules calculated by the methods devised by Hiley and by Delvax: Delvax's procedure calculated values for rate of growth/spacing which seemed to accord better with reality than did Hiley's procedure, especially for the Norway spruce.

H. C. Dawkins has continued his study of increment in tropical rain forest.

On April 17 Dr. Jones contributed a paper (unpublished) entitled 'The relation of the growth of forests to the soil' to the Symposium on 'soil productivity' held by the British Society of Soil Science.

TROPICAL SILVICULTURE

The Professor gave a course of 16 lectures on Tropical Silviculture to the postgraduate and fourth year students.

A series of 8 seminars on various aspects of the Regeneration of Tropical Forests was held under the leadership of the Professor and Demonstrators.

ECOLOGY

Teaching. The course of 8 lectures on General Ecology was given by Dr. G. W. Dimbleby to the postgraduate students in Michaelmas term. Dr. Dimbleby also gave 10 of the 16 lectures in a joint course on Ecology for the third-year students in Hilary term.

One undergraduate carried out a special subject project in Ecology this year on 'the relationship between pollen, rain and stand competition'. In addition a Cambridge graduate, Mr. G. Simpson, spent two terms learning palynological techniques prior to taking up an appointment under the Welland Valley Research Committee.

Research. Routine analytical work and special investigations have been in progress throughout the year, but in addition field reconnaissance has been made of forest soils in the south-west, paying particular attention to soils showing podzolization. On the basis of this and field studies in other districts it is proposed to investigate further the relationships between soil genesis and the ecological characteristics of the forest cover.

Dr. Dimbleby has continued to be Chairman of the British Association Committee on Experimental Archaeology. The last winter had dramatic effects on the artificial bank and ditch constructed on the chalk in 1960 and plans are in hand for the construction of a second earthwork, this time on a podzolized heathland site.

Mr. P. I. Porter has continued to be technical assistant and appreciation is expressed of the competent help he has given in all aspects of the work of the section.

TREE PHYSIOLOGY AND FOREST HYDROLOGY

Dr. L. Leyton continued in charge of this section and gave courses of lectures in Forest Soils and Tree Physiology. Dr. E. R. C. Reynolds, with the assistance of Mr. B. J. Kemp and Mr. E. A. S. Ogden concentrated on hydrological research and Mr. D. Clarke, who replaced Mr. M. Wilson, gave valuable assistance in nutritional research.

Investigations have continued into the hydrological relations of forest crops and now the final stages of developing and testing methods of measuring the various phases of the water balance have been reached. Using an array of rain gauges mounted above the canopy, it is relatively easy to obtain an adequately precise estimate of mean precipitation over a wooded area, but the absolute accuracy of the estimate is difficult to determine because of instrumental errors which vary with local conditions during and after each storm. The relative efficiency of various types of gauge has been studied by analysis of the effects of storm characteristics using multiple regression techniques. The results have been written up for a forthcoming symposium together with a plea for more studies on gauge efficiency under controlled conditions.

The interception of precipitation by forest crowns and its hydrological and physiological significance has been investigated. Leaf wetness recorders, on loan from the Meteorological Office, have been installed to record wetting and drying patterns in different regions of the tree crowns. Mr. K. F. Wells is making a special study of the fate of water intercepted by the foliage of young conifers, with particular reference to evaporation, transpiration and uptake. Mr. C. S. Henderson has investigated stem flow in different tree species. On an individual tree basis, beech gave the greater stem flow and larch the least, Norway spruce being intermediate. Analysis of the variation in stem flow between individuals of the same species indicated that in spruce, girth of the tree and branch angle were determining factors. Studies have begun on the absorption of intercepted water by conifer foliage. In collaboration with Dr. B. E. Juniper of the Department of Botany, electron micrographs have been prepared showing the fine structure of the waxy covering in different regions of pine and spruce needles. These have indicated areas where direct entry of water into the leaf may be possible and subsequent studies on surface wettability and water uptake have provided confirmation of this.

Much progress has been made in the development of apparatus for the automatic recording of sap flow in tree stems using a thermal flow technique. A sensitive potentiometric recorder has been installed and most of the initial operational problems have been overcome. Efforts are now being directed towards perfecting the calibration technique: plans are now in hand to replace the original polythene bag surrounding the crown by a stronger one

made of sheet terylene (Melinex); the method for measuring air flow rates through the bag is being improved as is the method of measurement of air moisture content before and after passage through the bag. A net radiometer is being installed over the experimental plantation so that energy relationships which govern evaporation and transpiration can be studied.

In the nutritional field, experiments carried out by R. B. Burdon involving cultures of *Pinus radiata* seedlings in flowing nutrient solutions of varying compositions have been concluded along with most of the analytical work. Results confirm that under the nutritional regimes giving growth, optimum phosphate supplies are of the order of 2-3 pp.m., i.e. similar to the amounts found in natural conditions in the field. It would also appear that uptake of phosphorus by the seedlings is determined almost solely by the level of phosphate supplied, and is independent of the proportions or levels of other nutrient factors. The results of this and previous cultural experiments are being written up for publication. In another investigation made in the field, Mr. A. J. Denyer has studied the potassium nutrition of poorly growing Corsican pine and has obtained evidence of a response in growth to the addition of this fertilizer.

SOIL MICROBIOLOGY

Dr. W. R. C. Handley remained in charge of this section and gave the usual course on examination of soils in the field and lectures on soil organic matter and soil organisms.

Research. In order to obtain litter in which the residual nitrogen is 'labelled', seedlings of various perennial species were grown with N¹⁵ as the source of combined nitrogen. The object of the investigation is to study the release of nitrogen from the litter when it is placed in contact with the soil. As, however, the quantities of litter produced by the end of 1961 were inadequate, the plants have been allowed to grow for another season and the investigation has had to be deferred until next autumn.

A preliminary experiment to investigate the nature of the interaction between *Calluna vulgaris* and tree species has been set up under controlled conditions.

A paper on 'Ectotrophic mycorrhizal fungi and the growth of trees on *Calluna* heathland' has been completed and awaits publication.

The work on protein-precipitating materials in leaves, supported by the Forestry Commission, has been continued in the Dyson Perrins Laboratory and a comparative study of these substances from the leaves of different plant species, using the methods developed by C. M. Love, has been begun.

The plant species investigated fall, with the exception of oak, into three sharply differentiated groups namely:—

- (a) Those in which protein-precipitating constituents have not

been detected. The litter of these species, which are usually associated with good supplies of mineral nitrogen in the soil, does not give rise to raw humus and is readily accepted by the soil fauna, especially earthworms.

- (b) Those in which the protein-precipitating constituents have the characteristics of hydrolysable tannins and whose litter does not give rise to raw humus.
- (c) Those in which the protein-precipitating constituents have the characteristics of condensed tannins. The plants of this group comprise species whose litter can give rise to raw humus and others whose litter is usually regarded as mull forming.

It is clear that, in the case of the plants of group (c), at least three different types of condensed tannin are involved.

1. Tannin containing both leucocyanidin and leucodelphinidin moieties.
2. Tannin containing leucocyanidin but no leucodelphinidin.
3. Tannin containing leucodelphinidin but no leucocyanidin.

No one of these groups is characteristic of the raw humus forming species. A great deal of chemical work remains to be done especially on the condensed tannins. For example, the leucodelphinidin moieties have so far been shown to account for at most 10% of the tannin. The greater part of the tannin that remains may or may not be composed of leucoanthocyanidins and variations in the chemical nature of these as yet unidentified parts of the tannin could well be the source of marked differences in, for example, the digestibility characteristics of the complexes that they form with residual leaf proteins since it is well known that even quite small modifications in molecular structure can result in large differences in biological properties. Unfortunately, the chemical methods at present available for the degradation of substances such as condensed tannins have either proved ineffective or are too drastic with the result that the fragments obtained do not give the necessary information.

Since it seems unlikely at present that progress can be made by the use of purely chemical methods, Miss S. M. L. Bocks, supported by the Forestry Commission, began work in October 1961, to attempt to use enzymes to break up the complex condensed tannin molecules and protein-tannin complexes. It is hoped that any resulting fragments will throw light on the structure of the condensed tannins and thereby elucidate the differences between the condensed tannins of the leaves of different plant species.

The so called white rot fungi are well known for their activity in decomposing the more complex constituents of wood and dead leaves and it therefore seemed possible that these organisms might be a source of enzymes capable of decomposing tannins and tannin protein complexes. However, the enzyme preparations

obtained so far from such organisms produced polymeric products from simpler phenols and are therefore unlikely to help in the step by step degradation of condensed tannins.

Unlike the white rot fungi, *Aspergillus niger* and *Penicillium solitum* do not produce phenoloxidascs but are able to decompose (+)—catechin which has close constitutional connections with the condensed tannins.

When *Aspergillus niger* and *Penicillium solitum* are grown in the presence of the various isomers of catechin it has been observed that whereas (+)—catechin and (—)—epicatechin are decomposed, (+)—epicatechin and (—)—catechin, which have the opposite stereochemistry at position 2, are unattacked. The opposite influence of such small differences in molecular structure on enzyme activity could have important consequences for the differential decomposition of the more complex polyphenolic substances, e.g., condensed tannins, which are to be found in the leaves of various plant species.

Although *Aspergillus niger* and *Penicillium solitum* when grown on (+)—catechin as the sole source of carbon reduce (+)—catechin to non-aromatic compounds after a few days, experimental conditions have been devised whereby an aromatic intermediate has been obtained and the enzyme system concerned may be of use in the stepwise degradation of condensed tannins.

FOREST BOTANY

The Curator of the Forest herbarium, Mr. F. White, was responsible for the teaching of Systematic Forest Botany. Mr. A. C. Hoyle, Forest Botanist, gave three lectures on the Ecology of Dry Tropical Woodlands.

In November Miss E. A. Curtis was appointed to the vacant post of Herbarium Assistant, Miss G. M. Howland, Junior Technician, resigned at Easter. There was no other staff change.

Mr. A. W. Exell, who has recently retired from the post of Deputy Keeper in the Department of Botany at the British Museum to a village in the Cotswolds, intends to remain an Editor of the *Flora Zambesiaca* and will be using the Forest Herbarium as his base.

Mr. White and Dr. B. T. Styles spent four weeks in September and October visiting the herbaria at Paris, Geneva, Zurich, Munich, Wageningen, Leiden and Brussels in connection with their work on *Ebenaceae* and *Meliaceae*. In April Mr. White and Mr. G. T. Prance made a short visit to the Brussels and Paris herbaria to study *Meliaceae* and *Chrysobalanoideae* respectively.

Research. (1) *Forest Flora of Northern Rhodesia*. Fifty advance copies were produced by the Holywell Press in May. The main distribution by the Oxford University Press is expected in the autumn of 1962.

(2) *Monographic work on the Meliaceae.* Satisfactory progress was made. Miss Curtis has prepared illustrations of 36 species. Mr. White and Dr. Styles finished the account for the *Flora Zambesiaca* and corrected the galley proofs. One short paper was also published. In the course of this work it has been discovered that the great majority of species have unisexual flowers, whose well-developed vestiges of the other sex have deceived most previous workers into assuming that they were dealing with bisexual flowers. *Turraea* is unusual in having bisexual flowers and a 'pollen-presenter' mechanism. The pollen grains of representatives of nearly half the genera have been photographed and studied. This approach is yielding important information on relationships. Evidence from palynology would justify the removal of *Ptaeroxylon* and *Nymanina* from the *Meliaceae*.

(3) *African Ebenaceae.* During the year Mrs. F. A. Dyer completed a set of 129 drawings illustrating the fruits of 78 African species and prepared an additional 82 beautiful drawings of the floral characteristics of 32 species. Mr. White published two papers: one summarising the geographical variation patterns of African species: the other describing a new species from Mosambique and Natal.

(4) *Generic Limits in the Chrysobalanoideae.* Mr. Prance made considerable progress. Currently accepted generic limits are unsatisfactory. Data have been collected for computer analysis in an attempt to decide which of several classifications is based on maximum correlations of characters.

(5) *Ecological Studies in Southern Province, Northern Rhodesia.* Of the specimens collected by Mr. White in 1960, 795 have been identified.

(6) *An Investigation into the Taxonomy of the Genus Pinus.* J. S. P. Sale studied fifteen morphological characters for 19 of the 21 species of Shaw's section *Haploxylon*, and discovered 5 previously unrecorded characters of taxonomic value. He concluded that subsection *Paracembra* of *Haploxylon* should have the same rank as *Haploxylon* and *Diploxylon*.

(7) *Taxonomy of the Cupressaceae.* J. P. C. Fry concluded that the separation of *Chamaecyparis* from *Cupressus* is unjustified.

(8) *Brachystegia.* Mr. Hoyle continued to name collections as received and to revise his definitions of groups in the light of the wider evidence now available. In many groups the number of readily observed characters that can be relied upon shrinks and the number of character-combinations expands with the increase in the size of the sample. Thus considerable doubt is cast on the value of the species-concept in relation to some of the largest populations. Towards the end of the year an account of the genus

for the *Flora of Tropical East Africa* was started. In this connection Mr. Hoyle helped Mr. Brennan of Kew in preparing a key to the *Caesalpinaceae*.

(9) *Plants of Bamenda Division, Western Cameroon*. A list of 325 plants collected by A. T. Johnstone was brought up to date by Mr. Hoyle and sent to Mr. Martin Brunt to assist in his land-use survey of Bamanda.

Forest Herbarium. During the year 2,818 specimens were received. The great majority (1,140) of the 1,607 specimens sent for naming came from Northern Rhodesia. The 1,211 named duplicates received from other institutions included 421 from the Jardin Botanique, Brussels (many Ebenaceae and Meliaceae), 33 from Pretoria, 128 from Wageningen (chiefly from the Ivory Coast) and 104 from the Forest Research Institute, Kepong. Valuable consignments of partly-named duplicates from the Federation of Rhodesia and Nyasaland were also received from the Federal Herbarium, Salisbury.

Other work included 406 identifications sent to Northern Rhodesia, 70 to Kenya, (specimens correlated with wood samples collected by Mr. T. J. Wormald), 35 to Tanganyika and 1,972 named duplicates distributed to other herbaria. Mrs. E. M. Woodley was responsible for the mounting of 3,113 specimens and efficiently attended to much of the routine herbarium work.

Visitors and Enquiries. As in previous years staff members, students and visitors continued to make use of the herbarium and consult the staff. Mr. A. Angus, a former staff member home on leave from Mount Makulu, spent some time in December working in the herbarium on his Rhodesian collections.

FOREST PATHOLOGY

Mr. W. R. Day was in charge of the section until his retirement in April 1962. Dr. T. W. Tinsley then took over as Forest Pathologist. Mr. Day gave his usual course of instruction to the Honour School.

Fungal Diseases. Much of the past year was spent in writing up experimental work for publication. The maintenance of stock cultures was continued and the usual enquiries dealt with.

Studies on the Dying of Bark in Conifers. This work is now ready for publication. Much of the evidence for the thesis that physical factors are of critical importance is presented in the form of photomicrographs and drawings of anatomical sections. The species used in the investigation were Sitka spruce and Norway spruce, Douglas fir and Japanese larch. This is a study of fundamental problems in growth requirements and is applicable to many other species.

Decay and Stain in Norway Spruce in Lake Vyrnwy. Recent thinnings have demonstrated that at Vyrnwy this disease is far more widespread than was originally thought. Since the staining of felled timber was a major-reason for the local rejection of timber for pulp the problem merits further study. The bacteria commonly isolated from the stained zones have been identified by the Commonwealth Mycological Institute at Kew and inoculation experiments are under way.

Virus Diseases. A preliminary survey of virus diseases of Hardwoods and Conifers has been made in the Oxford area. Suspected virus diseases have been recorded in ash, birch, elm, laburnum, beech, poplar, and European larch. A virus disease in *Populus candicans* has been transmitted to various test plants. A detailed investigation of this disease is being made.

One heated glasshouse has been screened with plastic gauze to provide a working house for virus studies.

FOREST ENTOMOLOGY

Mr. G. H. Thompson continued in charge of this section with Mr. E. R. Skinner as assistant. The usual undergraduate courses were given in Forest Zoology and Animal Ecology, and a special course on Tropical Forest Entomology was given to U Han Myint of Burma, who studied entomology exclusively during the Michaelmas and Hilary Terms; this course was also attended by Mr. C. W. Davis, a forest officer from Northern Rhodesia.

Mr. C. W. Holloway, of the Kenya Forest Department obtained a Forestry Diploma on a thesis entitled 'The effect of Big Game on Forest Management'.

Mr. E. O. A. Asibey of the Game Department, Ghana, spent from early May to the end of the year studying Game Conservation.

One third year student began an entomological special subject.

Research. (1) The ninth annual assessment was made of ash and sycamore billets laid down in 1953 in Wytham Wood for the study of insect succession; four billets of each species were analysed.

An average of 30% of the bark, in all cases very loose, remained on each species. The wood showed very advanced decay but the billets were still complete and could be lifted whole. The underbark fauna, as in previous analysis, mainly consisted of collembola, molluscs, woodlice, and worms. Elaterid, pyrochroid and tipulid larvae were present in the wood of both species. Old larval pyrochroid tunnels contained much the same fauna as occurred under the loose bark.

(2) Cinématography of living insects. During the year considerable progress was made in developing techniques for close-up cinéphotography of small arthropods. In this work the skill and interest of Mr. E. Howell of the departmental workshop proved invaluable. A start was made on a ciné record of the different types

of insect larvae used in the course on Forest Zoology ; an ecological film on the Tiger Beetle *Cicindela campestris* L. was nearly completed and good progress was made in a film on the biology of British spiders.

Miscellaneous. Mr. G. H. Thompson represented the University at the Annual General Meeting of the British Universities' Film Council; he also attended two Executive Committee meetings.

The Hon. J. S. Bloomfield, Minister of Education for Victoria, Australia, visited the Section in July for discussions on the use of visual aids for teaching at Universities.

The 16 mm. ciné film entitled 'The Alder Woodwasp and its Insect Enemies', which was produced in 1960, won two further successes during the year. It won the Grand Prix (Gold Bucranium) for the best film in the 6th Exhibition of Scientific Didactic Films held at Padua University under the auspices of the Venice Film Festival; all the major film-making countries participated. In the Vancouver International Amateur Film Festival the film won a Silver Plaque, the third prize for Overall Excellence; 24 countries were represented. The film was also invited to participate in the 3rd International Film Festival of Montreal, which is non-competitive. The film was used to illustrate talks on the Alder Woodwasp and its parasites to the following bodies during the year, viz., Bedford College, London; Department of Zoology, Cardiff; lunch-time lecture at the City of Birmingham Museum; Oxfordshire Teachers' Association, Ashmolean Natural History Society, Oxford.

MANAGEMENT

Mr. F. C. Osmaston remained in charge of the management section in which there was no major change.

The first course for Third Year undergraduates included 24 lectures in Hilary and Trinity Terms, a tour (which also included Silviculture) in Normandy and the Landes in March and five weeks practical work in the New Forest in September. The second course for Fourth Year undergraduates included 16 lectures in Michaelmas and Hilary Terms, two weeks' practical work in the New Forest in March and a tour in the French Jura and Switzerland.

The main course of lectures given by Mr. Osmaston was supplemented by Mr. T. E. Edwardson and Mr. W. A. Gordon who gave some lectures on aspects of management particularly applicable to Britain and tropical Commonwealth countries, respectively.

The practical work in the New Forest consisted in the preparation of a full working plan by each student for an area of 550 acres. The area provided considerable variation in both site conditions and growing stock. Problems to be solved included the choice of species, conversion or retention of hardwood high forest, choice of rotation and attainment of sustained yields as well as satisfaction of amenity demands. The practical work was in two parts. In

September, the basic data were collected. Each student then individually wrote Part I of his plan and submitted it for criticism which he was permitted to embody in his final Part I. Objects of management were given to the students in March so that on their second visit to the New Forest each could finish his plan with full prescriptions in Part II, being able to check in the field both the previous field work and the application of the prescriptions.

Mr. Osmaston also gave to Fourth Year undergraduates in Michaelmas and Hilary terms a course of 14 lectures on Silvicultural Systems, and to postgraduate forest officers 3 lectures on special points in management. He also took part in Seminars on the regeneration of tropical forests and other Discussion Groups.

Supervision and assistance were also given to postgraduate students, particularly those from Burma, India and Pakistan.

Mr. Osmaston was again Chairman of the Examiners for the Final Honour School of Forestry. He remained a member of the Regional Advisory Committee (E. England).

MENSURATION

Teaching. Lectures and practical classes in mensuration were given as usual to both Third and Fourth year undergraduates by Mr. Edwardson, who also gave a series of lectures as part of a postgraduate course, on selected points in mensuration and management, with emphasis on the use of the electronic computer. Mr. H. C. Dawkins (Uganda) and Dr. E. Brunig (Sarawak) kindly contributed lectures.

Field data collected in the New Forest Working Plan exercise were analysed by the same computer programme as in the past, but during the year Mr. J. N. R. Jeffers (Forestry Commission statistician) prepared a 'Mercury' version of the Forestry Commission standard enumeration programme for use on the next Working Plan exercise.

Mr. J. F. Scott of the Unit of Biometry spent a week on the New Forest exercise helping with statistical points.

Research. Computer work from the Commonwealth has continued to come in steadily and, in addition to the programmes used in the past, a Randomized Block programme written by Mr. J. F. Scott is now available and is having its first full trial on data from Fiji. A distribution study from Tanganyika was investigated with the help of the Forestry Commission statistician and an Association Analysis programme (Williams and Lambert) using a 'Pegasus' computer.

Mr. J. McN. Christie, Forestry Commission, demonstrated to the Fourth Year and some forest officers current sample plot techniques (plot Bagley No. 2 *Tsuga heterophylla*)

A diploma study by Othman bin Manan (Malaya) of factors affecting basal area increment in individual trees was supervised by Mr. Edwardson and a diploma was awarded.

Advanced studies by Messrs. Brookman-Amisshah of Ghana (Relascope and Permanent Sample Plot organisation) and Onochie of Nigeria (Growth Studies in Natural Forest) were also supervised. Help was also given in a Kenya study of loss of growth following big game damage (Holloway) and considerable practice was organized for 2 Malaysians, 2 Sudanese and 1 Nigerian at Oxford and, in two cases, also at Alice Holt in computer programme work.

The computer assistance of Mrs. Allington and her part time assistant are gratefully acknowledged.

British Forestry Advisory Work. Mr. Edwardson continued with advisory work on ornamental and shelter tree planting, including an exposed, sandy industrial site on Southampton Water.

Lectures on afforestation and forestry were given to the Nettlebed Young Farmers' Club and to the Women's Institute at Denman College, Marcham.

AERIAL SURVEY

The course of 8 lectures on photogrammetry and interpretation of aerial photographs was given by Dr. A. R. Robbins and Mr. F. C. Osmaston to postgraduate students in Michaelmas term. Each lecture was followed by two hours' practical work. Some Fourth Year students also attended the class.

In addition Dr. Langdale Brown, Assistant Director, Forest and Land Use Section, Directorate of Overseas Surveys, Tolworth, gave a special lecture in Trinity Term on the use of aerial photographs in Forestry. This lecture was succeeded by a visit to the Directorate of Overseas Surveys where the whole process of map-making from aerial photographs was seen.

Two forest officers, Mr. S. S. Gassoma from the Sudan and Mr. C. W. Davis from Northern Rhodesia, made advanced studies in Aerial Survey. They obtained considerable help from the Directorate of Overseas Surveys to whom cordial thanks are extended.

In November Messrs. Hilger and Watts demonstrated their new 'Stereosketch' for plotting detail from aerial photographs directly on to maps. Other instruments were also demonstrated.

STATISTICS

A course of lectures and practical exercises on elementary statistics by Mr. J. Fraser Scott of the Unit of Biometry was attended by Fourth Year and Postgraduate students.

WOOD ANATOMY

Dr. L. Chalk continued in charge of the section with Mr. A. A. Shaw and Mr. P. G. H. Franklin as his assistants. The usual undergraduate and postgraduate courses were given. Two under-

graduates and two forest officers carried out research for special subjects and advanced studies respectively.

Research. (1) *Buttress Roots.* Mr. J. D. Akpalu confirmed Braun's observations that the vessels may anastomose freely, and found that such anastomoses were common in two species without buttresses but were absent or relatively uncommon in two species selected for their prominent buttresses. A summary of 142 Ghana species showed buttressing to be very uncommon in species with fibre tracheids but common in association with libriform fibres and paratracheal parenchyma.

Mr. A. J. Hepburn investigated the frequency of the anastomosis of vessels in three tropical species, *Octomeles sumatrana*, *Cratoxylon arborescens* and *Intsia bijuga*, the first two species being without buttresses. Braun's plexus density quotient for representing the degree of anastomosis showed anastomosis to be less frequent in these three tropical woods than in the willow investigated by Braun and that among these three species anastomosis was slightly more frequent in the non-buttressing species. A new formula was suggested to take into account the diameter of the vessels.

(2) *Spiral Grain.* Mr. B. E. Jones investigated the cell adjustments in an extreme sample of spiral grain in *Pseudotsuga taxifolia* Brit. in which the grain changed from vertical to horizontal in a radial distance of about 1 cm. Successive tangential sections showed that there had been twice as many right-handed pseudo-transverse divisions of the cambium (parallel to the grain) as left handed, strongly suggesting a relation between these divisions and the direction of the grain. During the change of grain the rays retain their relative axial positions and appear to rotate about their centres. The tips of tracheids frequently withdrew from the left-handed side of a ray and reappeared on the right.

(3) *Fibre Length.* Mr. T. J. Wormald investigated two fast-grown and two slow-grown trees of *Pinus radiata* from Kenya. Fibre length was still increasing at the end of 17 years and the curves of increase outwards from the pith were very similar for both groups when plotted against age. In all four trees length at the outside had reached about 5 mm.

Mr. K. Arulchelvam made a study of fibre length in 5 plantation-grown *Eucalyptus robusta* trees from Ceylon aged 32 years. Length increased from the pith outwards up to a diameter of $7\frac{1}{2}$ to $8\frac{1}{2}$ inches and an average age of 9 years. Concurrent studies of the vessel member length showed that there was little change in the length of the fusiform initials and that the increase in fibre length was due primarily to elongation after cambial division.

Mr. Arulchelvam also measured the density of the *Eucalyptus* studied for fibre length and found a low density core of about 6 cm. diameter, outside which density rose steadily. In the sapwood there was an inverse relation between rate of growth and density.

The Wood Collection. The most important additions were 169 woods from the Forest Department of Northern Rhodesia per Mr. H. P. Mostyn and Mr. W. R. Bainbridge and 170 woods from the Forest Department of Northern Borneo per Mr. A. J. Hepburn. Other useful collections were received from the Forest Departments of Kenya (per Mr. T. J. Wormald) and Mauritius (Mr. W. R. Brouard) and exchanges of material made with various individual institutions.

FOREST ECONOMICS

This section remained under the charge of Mr. J. J. MacGregor. Mr. F. E. Balman has been engaged mainly on the Economic Survey of Private Forestry on which Mr. R. Lorrain-Smith has been full-time assistant.

Teaching. Lectures and tuition in Economic Theory and Economics of Forestry were given to the final year course. Seminars with the general theme of 'Forestry in the Economics of Developing Countries' were arranged for the Forest Officers' course. Supervision was given on a B.Sc. thesis on 'Some Principles of Forest Design in English Landscapes'.

Research. The economics of private forestry in England and Wales is still the main research project in the Section; emphasis is now given to the general economy and net income of private forestry. An initial study has been made on the likely effects of entering the Common Market.

FOREST LAW, TAXATION AND ADMINISTRATION

British Forest Law. Mr. W. A. Gordon gave a course of 20 lectures on British Forest Law, Land Tenure and Taxation to a class of Fourth Year Students. Five candidates took the subject in the Final Honour School of Forestry.

Colonial Forest Administration. Mr. Gordon gave a course of 12 lectures to a class of Fourth Year Students and Forest Officers. Six candidates took this as an additional subject in the Final Examination.

He also gave three lectures on Forest Management to the Fourth Year students and the Forest Officers, and two lectures on the legal aspects of Forest Protection to the Third Year Students. He also conducted two seminars for the Forest Officers on the Law of Evidence and Contract, and assisted at all the Forest Officers' seminars and discussions.

FOREST POLICY, FORESTRY AND LAND USE

The Professor gave a course (16 lectures) on Forestry and Land Use to the Third Year Students in the Michaelmas Term, and a

course of 12 lectures on Forest Policy in the Trinity Term to the Fourth Year Students.

FOREST UTILIZATION AND ENGINEERING

Twenty-four lectures in Forest Utilization and 15 in Engineering were given by Mr. C. J. W. Pitt. Twenty-five hours were spent on practical work including laying out curves, a new road project on the Wytham Estate, a small bridge project over the Cherwell, and on visits to a building site in Marston and to the cement works.

A practical course in the Institute Workshop on the maintenance and sharpening of saws was attended by the Forest Officers, and a similar one by the Third Year students. Most Forest Officers attended a course over eight afternoons on motor vehicle maintenance at the City of Oxford Technical College. Some Officers and some students also attended three-day courses on Land Rovers at the Rover Works, Solihull.

Most Forest Officers visited the Timber Development Association Research Station at Tylers Green, the sawmill and machine works of Messrs. Boughton near Amersham, Mallinson's veneer exhibition and timber yards and the 'Celcure' preservation plant and timber yard of Messrs. Montague L. Meyer in London.

Visits were also arranged for Forest Officers to Stenner's sawmill factory at Tiverton, the Machinery Research branch of the Forestry Commission at Alice Holt, various sites with portable sawmills, and several centres of the Forestry Commission where mechanical work was in progress. Mr. Pitt, one Forest Officer and one Research Student visited the Forestry Commission's Machinery Exhibition near Edinburgh.

Mr. Pitt made a short tour in the South West spending one day at Stenners, Tiverton, and three days with the Conservator and his mechanical and civil engineers visiting various sites in their conservancy. This was much appreciated.

A demonstration was held in Bagley Wood consisting of the McConnell Mobile Saw 14 D/CR, McConnell Ditch Cleaner, Danarm Chain Saw, and 'Alaska' Chain Mill. Another demonstration, talk and film on Fire Retardants, was held at the Institute.

Two sets of utilization films were shown.

PROTECTION

The course of lectures (5) on Fire Protection and anti-erosion measures was given by Mr. Pitt. The legal side of protection was dealt with by Mr. W. A. Gordon and the economic aspects by Mr. J. J. MacGregor.

SURVEYING

The usual course in Surveying was given to the Third Year students in the Trinity Term by Dr. A. R. Robbins of the Department of Surveying and Geodsey.

LIBRARY

The year began without the Librarian, who, as reported briefly in the previous annual report, had been seconded for a period of duty at the Faculty of Forestry of Istanbul University. During his stay, 14,000 books were classified by the 'Oxford Decimal Classification', and instruction was given in the application and use of this classification. He gave a talk on his work to an audience of about 60 in the Library of Istanbul University, and was present at discussions concerning the proposed new library for the Faculty of Forestry. The work was carried out under the direction of Professor Selâhattin Inal, with the help of Drs. Canakcioglu, Aytug, and Unlûgil, and the Librarian, Mrs. Urgenc.

At Oxford the 'List of Periodicals' was completed and distributed under exchange agreements and to libraries. In addition 68 requests for copies have been received.

Good progress has been made with the revision of the 'Basic List'. This is a list of books, classified by subject that are recommended as a basis on which to build a forestry library. Many requests have already been received for it, including an order for 30 copies from F.A.O. The work is now in its final stage of editing, and will be available, in the spring of 1963.

By courtesy of the Keeper of Scientific Books at the Radcliffe Science Library, the library received a most welcome gift of a number of duplicate volumes and parts of the Cumulative Book Index.

Visitors. Dr. Kissin (Brazil), Mr. M. V. M. Meyer-Homji (Pondicherry), Mr. J. A. Packman (Ibadan), Mr. H. Clepper (Society of American Foresters), Mr. M. A. Siddiqui (PANSDOC, Karachi), Mr. H. L. Dunkley, Professor C. M. Avila (University of San Andres, La Paz), Mr. Pollard (Tanganyika), Mr. D. F. Dyer (Jamaica), Mr. Kadambi (Mysore), Dr. Miraboglu (Istanbul), Mr. Chalmers (Trinidad), Major T. Price, Mr. C. D. Orchard (Canada), Mr. Akyildiz (Ankara), Mr. Ezzel Din Mamoun (Sudan), Mr. Amankwe (Ibadan), Mr. Halperin (Israel), Mr. Kemp.

Space in the library is now becoming a problem and the question of establishing microfilming facilities is under consideration. If the finance for this can be found, it will become possible to make the contents of the library available to other libraries, forestry departments and individuals throughout the Commonwealth and abroad.

Translations were increased by ...	...	...	139 (109)
Total number held in this library	...	...	974 (835)
New periodicals received ...	...	...	13 (5)
New series, incl. Annual Reports	...	...	34 (54)
Working Plans ...	...	...	28 (24)

LOANS

	Staff	Bureau	Students	Visitors	Outside Borrowers
Periodicals					
circulation ...	3123 (2828)	—	—	—	—
direct ...	177 (234)	170 (175)	448 (237)	74	483
Books ...	263 (223)	37 (66)	884 (824)	65	52
Miscellaneous	384 (610)	211 (148)	707 (553)	76	293
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	3497 (3895)	418 (389)	2039 (1614)	215	828
Total Loans = 7447 (6850)					

ACCESSIONS

Issues of periodicals	2001 (2132)
Current annual reports ...	...	...	205 (257)
Books ...	...	...	122 (127)
Maps ...	...	...	51 (60)
Miscellaneous (pamphlets, etc.) ...	...	...	2646 (2719)
			<hr/>
			5025 (5295)

CATALOGUE CARDS

Subject (Oxford) cards	19741 (17978)
Author (Oxford) cards	9885 (8672)
(Flury) cards	11 (287)
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29673 (26937)	

The approximate total number of cards in the catalogues is now 492874.

PHOTOGRAPHIC SECTION

During the year, the following major items were dealt with by the Photographer, Mr. H. F. Woodward.

Prints and enlargements ...	...	...	2448 (3349)
Photo copies ...	...	...	2043 (1241)
Dyeline prints ...	...	...	553 (267)
Photographs and Photomicrographs taken	...	...	277 (357)
Negatives processed ...	...	...	682 (1105)

In addition, the usual routine tasks of mounting, heat sealing, making lantern slides, projector maintenance, photo collection maintenance, etc. were continued. The stereoscope album of Bagley Wood Aerial Survey photographs was completed. The demand for photo copies and dyeline prints has almost doubled compared with the previous year.

APPENDIX I

PUBLICATIONS

GENERAL

Original Publications

- Forests and Water Supplies, by M. V. Laurie. Paper for Eighth British Commonwealth Forestry Conference, 1962.
- The Commonwealth Forestry Institute in 1962, by M. V. Laurie. Paper for Eighth British Commonwealth Forestry Conference, 1962.
- The Changing Face of Forestry, by M. V. Laurie. *Empire Forestry Review*, 41: 146-52.
- Factors in choosing forest species, by M. V. Laurie. *Span*, 5: 22-5
- E. P. Stebbing's 'The Forests of India', Vol. IV. Edited by H. G. Champion and F. C. Osmaston. *Oxford University Press*, 1962.
- Exotic Forest Trees in the British Commonwealth, by R. J. Streets. Edited by H. G. Champion. *Oxford University Press*, 1962.
- Forestry as a Competitor for Land: Some Problems in Land-Use Decisions, by J. J. MacGregor. Paper for Eighth British Commonwealth Forestry Conference, 1962.

Review

- Loblolly Pine by W. G. Wahlenberg. *Forestry* XXXV: 94-5 (M. V. Laurie).

SILVICULTURE

Original Publication

- Report on *Chlorophora*, by E. W. Jones. Colonial Office Research Publication, 1957. pp. 102.

Reviews

- The Natural Regeneration of *Eucalyptus regnans*, by T. M. Cunningham. Bulletin No. 1 of the School of Forestry, University of Melbourne, 1960. *Empire Forestry Review*, 40: 260 (E. W. Jones).
- Afforestation of Upland Heaths, by J. W. L. Zehetmayr. Forestry Commission Bulletin, No. 32, 1960. *Quarterly Journal of Forestry*, LV: 186-88 (E. W. Jones).
- Guides de Forêts de France, by G. Plaisance, Paris 1961. *Quarterly Journal of Forestry*, LVI: 174 (E. W. Jones).
- Les forêts acidophile du Jura, by J. L. Richard, Berne 1961. *New Phytologist*, 61: 107-8 (E. W. Jones).
- Synecology and Silviculture of Ghana, by C. J. Taylor. *Empire Forestry Review*, 40: 268 (C. J. W. Pitt).

Original Publication

The development of British Heathlands and their Soils, by G. W. Dimbleby. *Oxford Forestry Memoir*, No. 23, 1962.

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- The Preservation of Timber, by W. P. K. Findlay. *Quarterly Journal of Forestry*, LVI: 260-61 (C. J. W. Pitt).

APPENDIX II

I. STAFF ENGAGED IN INSTRUCTION AND RESEARCH

- PROFESSOR M. V. LAURIE, O.B.E., M.A., (Oxon), M.A. (Cantab).
Tropical Forestry, Forestry and Land Use, Forest Policy.
L. CHALK, M.A., D.Phil. (Oxon). Wood Structure and Properties.
W. R. DAY, B.Sc., M.A. (Oxon). Pathology, Forest Hygiene.
(Until 31 March, 1962).
T. W. TINSLEY, M.A. (Oxon), B.Sc. (Durham), Ph.D. (Lond.).
Forest Pathology (From 1 April, 1962).
E. W. JONES, M.A. (Oxon), Ph.D. (Cantab). Silviculture.
C. J. W. PITT, M.A. (Oxon), B.Sc. (Grahamstown). Forest
Engineering and Utilisation.
G. H. THOMPSON, B.Sc., M.A. (Oxon), Forest Zoology, Entomology.
T. E. EDWARDSON, B.Sc., M.A. (Oxon), B.Sc. (For.) (Edin.).
Mensuration, British Forestry.
W. A. GORDON, M.A., Dip. Anth. (Oxon), Bar.-at-Law (Lond.).
Colonial Forestry, Forest Law.
F. C. OSMASTON, M.A. (Oxon). Forest Management, Aerial
Survey, Silvicultural Systems.
J. J. MACGREGOR, B.Litt., M.A. (Oxon), B.Sc. (Glasgow), M.S.
(Wisc.).
W. R. C. HANDLEY, M.A. (Oxon), Ph.D. (Leeds). Microbiology.
L. LEYTON, M.A. (Oxon), Ph.D. (Leeds). Tree Physiology.
G. W. DIMBLEBY, B.Sc., M.A., D.Phil. (Oxon). Forest Ecology.
A. C. HOYLE, B.Sc., M.A. (Oxon). Forest Botany and Ecology.
F. WHITE, M.A. (Oxon), M.A. (Cantab). Forest Botany.
E. R. C. REYNOLDS, B.Sc., Ph.D. (Lond.), D.I.C., A.R.C.S.
Forest Hydrology.
B. T. STYLES, M.A., D.Phil. (Oxon). Forest Botany.

II. STAFF OF OTHER UNIVERSITY DEPARTMENTS ASSISTING IN INSTRUCTIONAL WORK

- P. H. T. BECKETT, M.A., D.Phil. (Oxon). Soil Science.
A. R. ROBBINS, B.Sc., M.A., D.Phil. (Oxon). Surveying and Aerial
Survey.
J. FRASER SCOTT, M.A. (Oxon). Statistical Methods.

III. OTHER STAFF

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19. *The Use and Misuse of Land*, by R. MacLagan Gorrie. 1935. 6s.
23. *The Development of British Heathlands and their Soils*, by G. W. Dimbleby. 1962. £3. (Available only from Clarendon Press, Oxford.)
24. *Forest Coleoptera of Ghana; Biological Notes and Host Trees*, by G. H. Thompson 1963. (Available only from Clarendon Press, Oxford.)

Others in preparation

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Nos. 2-14, 20, 23 and 34 are out of print.

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